MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016 / 2017

PEM0016 – ALGEBRA

(All sections / Groups)

18 OCTOBER 2016
2:30 p.m. – 4:30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of **THREE** printed pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.

Answer ALL questions [100 marks].

QUESTION 1 [25 marks]

a. Use the substitution $y = 2^x$ to solve for x the equation $2^{2x+1} - 2^{x+1} + 1 = 2^x$. [5 marks]

b. Solve $\sqrt{2x-3} = \sqrt{x-2} + 1$. [7 marks]

c. Solve the inequality $\frac{m^2 - 7}{m^2 - m - 6} \leq 1$. [8 marks]

d. The first four terms in expansion of $(1-x)^6$ are $1 - 6x + px^2 + qx^3$. Find the value of p and q. [5 marks]

QUESTION 2 [25 marks]

a. If $f(x) = \frac{6}{x-4}$ and $g(x) = 3x - 8$. Find:

i. the domain of $f(x)$. [1 mark]

ii. $(f \circ g)(2)$. [2 marks]

iii. $(f \circ g)^{-1}(x)$. [4 marks]

b. Graph the piecewise-defined function below. State the domain and range of the function.

$$f(x) = \begin{cases} x^2 & ; -2 \leq x \leq 0 \\ -\sqrt{x} & ; 0 < x < 1 \\ |x+2| & ; x > 1 \end{cases}$$

[10 marks]

c. Graph the function $f(x) = 3 - \log_2(x-1)$ using transformations. Show each transformation in separate graph. Label two coordinates and asymptote (if any) in each graph. [8 marks]

Continued...

QUESTION 3 [25 marks]

a. Express $\frac{x+4}{(x+1)(x-2)^2}$ in partial fractions. [9 marks]

b. Use synthetic division to determine whether $(x-2)$ is a factor of the function $f(x)=3x^4-2x^2+7x-5$ or not. [5 marks]

c. Given a polynomial function $p(x)=x(2x+4)(x-3)^2$.

i. Use the Leading Coefficient Test to determine the end behavior of the graph of $p(x)$. [3 marks]

ii. Determine all real zeros of $p(x)$ and identify the behavior of graph at each x intercept. [5 marks]

d. Find the domain of rational function $r(x)=\frac{3x-2}{x^2-3x+2}$. [3 marks]

QUESTION 4 [25 marks]

a. Solve the matrix equation for X if $4A+3B=-2X$. Given

$$A=\begin{bmatrix}-3 & -7\\ 2 & -9\\ 5 & 0\end{bmatrix} \quad \text{and} \quad B=\begin{bmatrix}-5 & -1\\ 0 & 0\\ 3 & -4\end{bmatrix}$$ [5 marks]

b. Find AB if $A=\begin{bmatrix}4 & 2\\ 6 & 1\\ 3 & 5\end{bmatrix}$ and $B=\begin{bmatrix}2 & 3 & 4\\ -1 & -2 & 0\end{bmatrix}$. [4 marks]

c. Solve the following system by using the inverse of the coefficient matrix, A^{-1}.

$$\begin{aligned}3x+y+4z&=1\\ x+z&=0\\ 2y+z&=2\end{aligned}$$

[16 marks]

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